

August 26, 1999

Mr. Thomas J. Palmisano  
Site Vice President and General Manager  
Palisades Nuclear Generating Plant  
27780 Blue Star Memorial Highway  
Covert, MI 49043-9530

Dear Mr. Palmisano:

On July 28, 1999, the NRC completed a special inspection of the performance of Consumers Power Company employees in loading dry fuel storage casks at your Palisades Nuclear Power Plant. The results of that inspection were discussed on that date with you and other members of your staff. Our report of the inspection is enclosed for your information.

The purpose of the inspection was to observe various portions of the dry fuel cask loading activities, with a focus on management oversight and controls, safe handling of fuel, control of radiological and other hazards, and implementation of actions that you were required to have in place to minimize recurrence of past problems with the cask closure welds.

Our inspection identified several minor violations of NRC requirements, which are discussed in the enclosed report. These minor violations were typically self-identified by licensee personnel, reported, and entered into your corrective action system for any needed follow up action. In accordance with the NRC Enforcement Policy (NUREG-1600) no Notice of Violation is being issued for these items.

As we discussed in our meeting of July 28, the 1999 cask loading program at Palisades began poorly. Unexpected events occurred indicating poor worker attentiveness and discipline. These events were not promptly reported to proper authorities within the Consumers Power organization. As a consequence, effective corrective and preventive actions were delayed. Both your organization and the NRC had placed a high level of focus on preparations to perform the 1999 loading program. The manner in which certain aspects of the loading of the first cask were performed clearly did not meet our mutual expectations.

After station management became aware of the problems which occurred, they intervened aggressively and, as evidenced by good performance in loading the remaining casks, their intervention proved successful. Your processes for management oversight, self-critical performance evaluation, and reporting and resolution of identified issues came into line with our expectations.

T. Palmisano

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In accordance with 10 CFR 2.790 of the NRC's "Rules of Practice," a copy of this letter and its enclosure will be placed in the NRC Public Document Room.

We will gladly discuss any questions you have concerning this inspection.

Sincerely,

Original signed by

Bruce L. Jorgensen, Chief  
Decommissioning Branch

Docket No. 72-0007

Enclosure: Inspection Report 72-0007/99002(DNMS)

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Fossil and Hydro Operations  
N. Haskell, Director, Licensing  
R. Whale, Michigan Public Service Commission  
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REGION III

Docket No:	72-0007
Report No:	72-0007/99002(DNMS)
Licensee:	Consumers Energy Company
Facility:	Palisades Nuclear Power Plant
Location:	27780 Blue Star Memorial Highway Covert, MI 49043
Dates:	June 7, 1999, through July 28, 1999
Inspectors:	R. B. Landsman, Project Engineer M. LaFranzo, Radiation Specialist R. Krsek, Resident Inspector
Approved By:	Bruce L. Jorgensen, Chief Decommissioning Branch Division of Nuclear Materials Safety

## **EXECUTIVE SUMMARY**

### **Palisades Nuclear Power Plant NRC Inspection Report 72-0007/99002(DNMS)**

This was a special inspection to observe various portions of the loading of the fourteenth, fifteenth, and sixteenth dry fuel storage casks at the Palisades plant. Portions of all phases of the fuel movement activities were observed starting with the initial spent fuel movements in the spent fuel pool and concluding with the placement of the storage casks on the Independent Spent Fuel Storage Installation pad.

Overall, the cask loading program for 1999 began poorly. A hydrogen burn event was not promptly reported or corrected, and the problem recurred. Other minor problems also occurred, which showed the expected level of care and caution for the first cask loaded in 4 years (since before the Point Beach hydrogen ignition) was not achieved. In particular, expectations were established in previous NRC Confirmatory Action Letters and in NRC Bulletin 96-04, regarding minimizing potential for hydrogen ignition and providing procedures and training to ensure proper response to any ignition. These expectations, for a variety of reasons, were not met. However, there was no direct safety significance to the burn and/or other issues. The last two casks were given the proper attention and the loadings went well, with fewer and even less significant issues.

Problems identified and addressed included:

- worker recognition of items to be reported to management
- overall management presence and visibility
- organizational interfaces
- procedural deficiencies (completeness, clarity or detail issues)
- need for careful evaluation of changes, to identify potential unintended consequences

A fire in the office trailer housing the dry fuel storage staff resulted in the destruction of the facility and loss of documents and personal effects. However, there is a high degree of confidence that no documentation was lost in the fire which is required by Part 72.

Radiation protection functions were conducted in a manner which controlled potential hazards, limited exposure and otherwise met applicable regulatory requirements.

## Report Details

### 1.0 Loading of the Fourteenth, Fifteenth, and Sixteenth Casks

#### a. Inspection Scope (60855)

The inspectors observed various portions of the loading of the fourteenth, fifteenth, and sixteenth casks to verify compliance with the applicable sections of the loading procedures.

#### b. Observations and Findings

During the loading of the fourteenth cask, there were a number of unanticipated events which impacted the schedule and resulted in draining the multi-assembly sealed basket (MSB) before all the welding and testing were complete. This resulted in approximately 25 mrem extra dose out of 450 mrem total for the fourteenth cask.

#### Hydrogen Burns

The first issue that came up was the hydrogen vent line which inadvertently became disconnected from a HEPA filter intake which caused a hydrogen ignition during welding preparations of the structural lid. On two different shifts on June 9, welders were grinding on the weld backing ring when sparks ignited the escaping gas at the end of the tygon vent tube, creating a small (1 to 2 inch) flame. The failure to communicate the issue to on-shift personnel and to plant management was discussed in Inspection Report 50-255/99008(DRP).

These occurrences were particularly unexpected in light of previous VSC-24 cask history. A hydrogen ignition event at the Point Beach nuclear plant in 1996 precipitated Confirmatory Action Letters to VSC-24 users, and NRC Bulletin 96-04, directing licensees to the issues of minimizing potential for explosive gas ignition and providing procedures and training to properly respond to an ignition. Palisades responses had been considered satisfactory. The events of June 9 illustrated that there were deficiencies in several areas:

- C The welders did not understand that they had a fire; they thought that only when you call for help to put out burning material, that classifies as a fire.
- C Personnel thought that it was a minor event; the Point Beach event lifted the 3-ton lid several inches.
- C A Condition Report was not immediately generated, which was contrary to site procedures. Personnel were unsure how to describe the event in written words without the description being construed as a big event when subsequently read. They thought it might result in a job stoppage.
- C Overall management presence during the evolution was weak from both

the dry fuel storage (DFS) organization and station line management. Day shift DFS management was distracted by performing other administrative duties. Night shift DFS management consisted of a supervisor inexperienced in DFS activities. No station line management oversight was assigned to the night shift.

- C DFS organizational interface with the operations shift was weak or non-existent.
- The DFS management team did not reinforce the standards and expectations for achieving success.
- The initial installation and configuration of the vent path was left up to the crew. The procedure did not give instructions on the material for the vent line and “dry runs” were done with no hydrogen being generated. Flammable tygon tubing which had been used thirteen times previously before this with no problems was used for a fourteenth time. Site procedures do not allow combustible materials within a thirty-five foot radius of a hot work location. The procedure also did not give instructions on the routing of the vent tube to the elephant trunk of the HEPA filter. As a result, since the elephant trunk was installed directly over the center of the MSB for air-born radiation control, and about 3 feet above, the tygon tube was run the shortest distance and merely duct taped into the elephant trunk.
- Turnover between welding crews was not rigorous and did not mention the initial flame. Opportunities to discuss lessons learned and/or management expectations were not appropriately communicated between shifts.
- C Several issues were not documented in project log books for later retrieval and review, i.e., the initial burn.

Even though all these issues surfaced after the event, there was no actual safety significance attached to the actual fire. Since these failures constitute violations of minor significance, they are not subject to formal enforcement action, by the NRC.

When station management became aware of the hydrogen ignitions, work was temporarily stopped until actions were taken to resolve the problems encountered. These actions included:

- C Changing the vent line material to a braided metal stainless steel hose, with a discharge of more than twenty feet away from the MSB; this was proceduralized.
- C Requiring formal turnover between all the crews.
- C Strengthening the DFS supervision coverage by changing their work schedule from 12 hours to 8 hours.

- C Retraining the welders on what constituted a fire.
- C Requiring continuous station management oversight on the whole activity.

#### Drain Down Time

The second issue that came up involved the administrative drain down time limit of (59 hours) being exceeded. The process of loading a cask requires the MSB to be drained within a prescribed time once it is removed from the pool. The water is retained as long as possible to reduce the radiation dose received by personnel working on the MSB closure welds, but it must be removed in order to prevent bulk boiling and ensure criticality safety. The administrative limit required draining of the water to begin within 55 hours after leaving the pool and that it be fully drained within the next 4 hours. Drain down of the MSB was initiated within the 55 hour requirement but draining took longer than was expected such that the MSB was not fully drained within the required time. It took until 59 hours and 35 minutes to complete the drain down.

The administrative limit was set using very conservative input values in the Certificate of Conformance (CofC) equation: a pool temperature of 100 degrees Fahrenheit (EF) and a heat load of 15 kilowatts (kw). The actual heat load was lower and the Spent Fuel Pool (SFP) was cooler, which provided additional safety margin. Using the actual fuel load of 14.7 kw, and the actual SFP temperature of 87.5EF yielded a drain down time of 67.7 hours to meet the CofC limit.

During previous loadings, the MSBs were drained immediately after the shield lid to the shell weld was completed and tested. Since then, changes were made to address the weld cracking issues. These additional steps had the potential for increasing radiation exposure to welders and other personnel involved. Consequently, changes were made to allow the water to remain in the MSB to keep radiation dose as-low-as-reasonably-achievable (ALARA). Starting the drain down 4 hours prior to the time limit was thought to be sufficient to satisfy the time limit on the basis of previous experience. Previous loadings had drained in approximately 2 to 2 ½ hours.

A change was made to the MSB drain system assembly on the suction side. A ball valve was removed from the system and replaced with a bellows sealed valve. This apparently restricted the water flow. No preoperational testing was performed on this revised assembly to determine its effect on the draining system. Also, the loading procedure contained no method of determining the flow through this new alignment, early in the loading process. If the actual flow amount would have been available early in the loading, sufficient time would be available to take appropriate actions. There were also no contingencies in the loading process to accommodate the impact of equipment problems or other emergent distractions.

These issues were identified after the event. There was no actual safety significance attached to the drain-down delay. These failures constitute

violations of minor significance and are not subject to formal enforcement action by the NRC.

Corrective actions to address these issues were as follows:

- The procedure now requires that the flow in the draining system be checked early in the process.
- Drain down time will now be initiated 10 hours prior to the time limit when the MSB must be completely drained. It will begin within 49 hours of breaking the plane of water in the SFP.
- The old valve was changed out and the SFP drainage skid was modified to allow helium pressure in as a back-up system for water removal in the event that the primary method fails. Realignment statements in the procedure have been provided.

### Gap Shims

The third issue that came up was a step in the procedure that required the removal of the shims from the multi-assembly transfer cask (MTC)/MSB gap area in order to begin ultrasonic testing (UT). This step could not be accomplished because there were no shims in the gap area. The shim rig segments are inserted between the inner MTC wall and the outer surface of the MSB. The shim rings should have been removed and reinstalled as part of the decontamination efforts taking place just after the MTC/MSB is removed from the SFP in a previous step. The rings were never reinserted and were found abandoned near the decontamination equipment.

The fit of these shim segments is fairly tight, to provide a debris barrier from welding material falling into the MTC/MSB gap. With absent shim rings, some slag was found in the gap. This had no impact on the lifting, cooling, and MSB transfer functions of the MTC. Insignificant portions of any slag could be dropped into the ventilated storage cask (VSC) while transferring the MSB into the VCC. The quantity of slag dropped into the VSC would be small because most of the captive slag would be dropped onto the top of the MTC doors and translated out of the way when the doors are opened for the MSB transfer.

The shim rings were not reinstalled because:

- C The procedure used various confusing terminology when referring to these shims.
- C The procedure had only a single step to remove, decontaminate, and replace the shims. A health physicist technician who was new and unfamiliar with the cask work signed off this step. The technician asked the welder if the shims were installed, the welder thought the technician was referring to the root gap shims, and answered affirmatively. The technician then signed off on the replacement.

- C Another minor issue arose when the crew reached the procedure step, to set the UT equipment on the structural lid. This step could not be accomplished as specified without first removing the MTC adapter fixture (holds the welding carriage) which was in the way.

There was no actual safety significance attached to the missing shims, or to the MTC adapter fixture being in the way. These failures constitute violations of minor significance and are not subject to formal enforcement action by the NRC.

The procedure has been revised to consistently use the same terminology when referring to the MTC/MSB shims. Also, a step was added to require verification that the "MTC shield ring segments" have been installed after the decontamination process. Finally, a step was added to remove the MTC adapter fixture.

### Lessons Learned

After the loading of the fourteenth cask was complete and on the pad, lessons learned from this event were explained to all personnel working on the casks with the focus being on specific standards/expectations for the project, i.e., compliance with site procedures, fostering a questioning attitude, and the need for documentation/communication of conditions to plant management. This self-assessment led to the schedule being delayed two weeks for the next load in order to conduct the briefings and identify any more process and procedural changes necessary from lessons learned.

Casks fifteen and sixteen went much smoother with fewer, less significant problems. All the procedural tasks were completed correctly during these two loadings. Minor problems that occurred were quickly brought to the attention of management. Excellent communication between dry cask staff and plant staff was evident. Senior management oversight provided good observations on work activities.

### c. Conclusions

Overall, cask loading program for 1999 began poorly. A hydrogen burn event was not promptly reported or corrected, and the problem recurred. The expected level of care and caution for the first cask loaded in 4 years (since before the Point Beach hydrogen ignition) was not achieved. However, there was no safety significance to the burn and/or the other issues identified. The next two casks were given the proper attention and the loadings went well with fewer, less significant issues.

## **2.0 Dry Fuel Storage Office Trailer Fire**

### a. Inspection Scope (92701)

The inspectors reviewed the circumstances surrounding the June 17, 1999, fire and related document loss at the DFS office trailer.

b. Observations and Findings

The impact of the fire damage on the DFS records being held as work-in-progress was evaluated to ascertain if the documentation required by Part 72 is available to support the storage of spent fuel at Palisades. The fabrication records and the loading documentation for the first thirteen casks were not affected by the fire. Fabrication records for the five casks to be loaded during phase III (1999) were intact. NRC review of this documentation was reviewed in Inspection Report 72-007/99001(DNMS); the review confirmed that the new casks met the design and were fabricated in conformance with the safety evaluation. Governing procedures, instructions, engineering analyses, and drawings necessary to support loading are available. The loading documentation for cask fourteen is available. Training records are available. 72.48 evaluations are available. Some supporting documents had not yet been retrieved, as follows:

Selected design reference documents referred to in the 20 engineering analyses (EAs).

- C 14 of 20 EAs have been retrieved.
- C 34 of 38 engineering design changes have been recovered.
- C Procurement documents are being retrieved from vendors.
- C DFS qualification cards are being recovered.

The licensee was working to locate the above documentation to re-construct those records as necessary. Preliminary review indicates that these documents can be reconstructed.

There has been no cause determined for the DFS trailer fire to date.

The storage of work-in-progress documents will be proceduralized to be stored in fire-proof cabinets.

c. Conclusions

There is a high degree of confidence that no documentation was lost in the fire which is required by Part 72. A final reassembly inventory will be made available in the near future.

### **3.0 Radiation Protection**

a. Inspection Scope (83750)

The inspector reviewed portions of the radiation protection coverage of the loading, decontamination and movement of the first cask in the 1999 loading program and evaluated licensee compliance with NRC regulations for radiation protection.

b. Observations and Findings

Dosimetry

The inspector interviewed Radiation Protection (RP) staff and other workers who had access to radiation or high radiation areas. The inspector noted that each individual possessed the appropriate dosimetry while performing activities in radiation areas.

The inspector reviewed radiation exposures to licensee staff involved in the operation. The licensee's projected dose and actual dose received were within acceptable limits. Expected dose from these activities are expected to be slightly higher than from other cask loadings as the procedures for welding the shield and structural lids were modified from previous loadings to decrease the possibility of cracks or other defects in the welding process.

Palisades Health Physics Procedure No. HP 2.29 states, in part, that extremity monitoring is required when the beta plus gamma contact dose rate of the component to be worked is five times greater than the ambient dose rate to the whole body (12 inches from the contact dose rate) and when dose to the extremity is expected to exceed 500 mrem (5 mSv) for that task. The inspector reviewed dose rate measurements taken by the RP staff around the cask and time factors involved in each operation and determined that the licensee correctly assessed that extremity dosimetry was not required as per HP 2.29. In addition, the inspector reviewed the licensee's assessment and noted that extremity monitoring would not be required pursuant to 10 CFR Part 20 under current radiological conditions.

Radiation Areas and Contamination Control

The inspector reviewed the implementation of the licensee's radiation area and contamination control programs. All areas with radiation levels in excess of 5 mrem (50 uSv) were appropriately posted as required and all areas in excess of the licensee's contamination limits were posted as required. Control barriers were maintained and properly supervised to ensure doses were kept ALARA and to minimize the spread of contamination.

The inspector performed a radiological survey in the area of work and compared radiation levels identified to radiation levels documented earlier by the licensee. No significant deviations were identified between the two sets of data.

Radiation Work Permit (RWP) Protocols

The inspector reviewed RWP's 990010, 990300, 990320 and 990340 and determined that each RWP possessed the appropriate information to ensure clear guidance on expectations for each permit. Several radiation workers who were working under several of the above RWP's were interviewed. Each individual interviewed was aware of the RWP limitations which they were working under and, through NRC observation, did not deviate from the appropriate RWP.

c. Conclusion

No significant radiological hazards or conditions were noted which the licensee did not address. In addition, no significant or abnormal radiation exposures were received by licensee staff during the course of cask loading, decontamination and welding. No violations of NRC requirements were identified.

**4.0 Exit Meeting Summary**

The inspector presented the inspection results to members of licensee management at a public exit meeting at the plant training building at the conclusion of the inspection on July 28, 1999. The licensee acknowledged the findings presented. The licensee did not identify any information discussed as being proprietary.

## **PARTIAL LIST OF PERSONS CONTACTED**

J. Broschak, Program Manager - Dry Fuel  
N. Haskel, Director, Licensing  
T. Palmisano, Site Vice President  
D. Rogers, General Manager - Plant Operations

## **INSPECTION PROCEDURE USED**

IP 60855: Operation of an ISFSI  
IP 83750: Occupational Radiation Exposure  
IP 92700: Onsite Follow-up of Written Reports of Non-Routine Events at Power Reactor Facilities

## **LIST OF ACRONYMS USED**

ALARA	As-Low-As-Reasonably Achievable
CofC	Certificate of Conformance
DFS	Dry Fuel Storage
EA	Engineering Analyses
EF	Degrees Fahrenheit
HEPA	High Efficiency Particulate Air
kw	Kilowatts
MSB	Multi-Assembly Sealed Basket
MTC	Multi-Assembly Transfer Cask
SFP	Spent Fuel Pool
UT	Ultrasonic Testing
VSC	Ventilated Storage Cask

## **LIST OF DOCUMENTS REVIEWED**

The licensee documents reviewed and utilized during the course of this inspection are specifically identified in the "Report Details" above.